

# Linking Land Use and Transportation Through Street Design

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## **ABSTRACT**

Metro’s regional street design policies will guide the eventual design of major streets in the 24 jurisdictions that make up the Portland metropolitan area. The street design classifications represent the most direct link between land use and transportation planning in the region, and also serve as a tool for coordinating various, often competing modal needs. The design classifications are mapped at a detailed level to provide specific direction for local implementation. The *Creating Livable Streets* handbook is a resource for local implementation of the regional street design policies. The handbook provides a primer on general design issues, as well as specific design solutions that address each of the regional street design classifications individually.

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## **THE CHALLENGE: GROWING NEED TO LINK LAND USE AND TRANSPORTATION**

In 1991, sweeping changes at the federal, state and regional levels changed the scope of transportation planning in the Portland region. The federal Intermodal Surface Transportation Efficiency Act of 1991 has dramatically altered the funding priorities for projects that include federal support. Meanwhile, the Oregon transportation planning rule (TPR) promotes travel alternatives to the automobile, and sets aggressive goals for reducing per capita automobile travel. The TPR focuses on the link between land use and transportation, and requires the region to consider land use policies when developing transportation plans. The TPR requires cities and counties to revise development standards to promote public transportation, pedestrian and bicycle travel; orient new buildings toward major transit stops; and implement local street designs that require less right-of-way width and improve pedestrian circulation.

At the regional level, the 1992 Metro charter directs the agency to complete the Regional Framework Plan (RFP), a broad comprehensive plan that sets regional land use and transportation policy consistent with state and federal mandates. In order to develop the plan, Metro worked with local partners to create the 2040 Growth Concept, a fifty-year land use and transportation vision for the region. The 2040 vision guided

development of the more detailed Regional Framework Plan, adopted in 1997, which now provides a land use and transportation context for local comprehensive plans in the Portland region.

As these policies are implemented through regional and local plans, the role of transportation in either leveraging or hindering planned land uses has become increasingly apparent. Local jurisdictions are under pressure to relieve congestion along major routes by added vehicle capacity, often at the expense of adjacent land uses and other modes. Yet the emphasis on relieving congestion leaves little funding for multi-modal reconstruction projects intended to leverage land use plans.

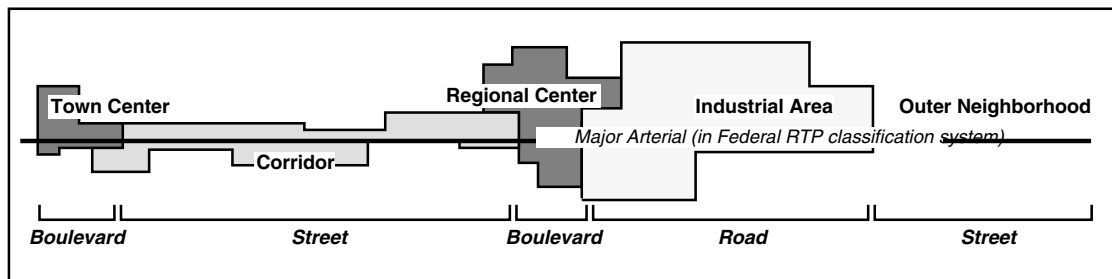
## **THE APPROACH: STREET DESIGN CLASSIFICATIONS**

The RFP addresses these federal, state and local mandates with a series of street design concepts that mix land use and transportation planning in a manner that supports specific land use components of the plan. These design concepts reflect the fact that streets perform many, often conflicting functions, and the need to reconcile conflicts among travel modes. The design classifications now work in tandem with the traditional modal system maps that are also included in the plan.

The regional street design concepts are intended to serve multiple modes of travel in a manner that supports the specific needs of the RFP land use components, such as town centers, neighborhoods and main streets. They were developed using intuitive, user-friendly terminology that invites citizens to participate in the design of major streets. They are not intended to replace engineering cross-sections. Instead, the design classifications are a way to ensure that incremental improvements to the transportation system enhance adjacent planned land uses. The street design concepts fall into five broad classifications:

- *Throughways* that emphasize motor vehicle travel and connect major activity centers. Throughway designs are divided into “highway” and “freeway” types that address the degree of desired access management on a given facility;
- *Boulevards* that serve major centers of urban activity and emphasize public transportation, bicycle and pedestrian travel while balancing the many travel demands of intensely developed areas. Boulevard designs are further divided into “community” and “regional” types that address varying degrees of motor vehicle through-traffic;
- *Streets* that serve transit corridors, main streets and neighborhoods with designs that integrate many modes of travel and provide easy pedestrian, bicycle and public transportation travel. Street designs are also divided into “community” and “regional” types that address varying degrees of motor vehicle through-traffic;
- *Roads* that are traffic oriented with designs that integrate all modes but primarily serve motor vehicles. Roads are further divided into “urban” and “rural” types that address varying freight, pedestrian and bicycle needs; and
- *Local streets* that complement the regional system by serving neighborhoods and carrying local traffic.

These design concepts apply to the regional system as it relates to specific RFP land use components. Figure 1 provides a chart of regional street design classifications for a theoretical roadway and typical land uses. In this example, the motor vehicle functional



**FIGURE 1 Applying street design classifications to the design map.**

classification for the roadway is “major arterial,” while the street design classification varies according to planned land use.

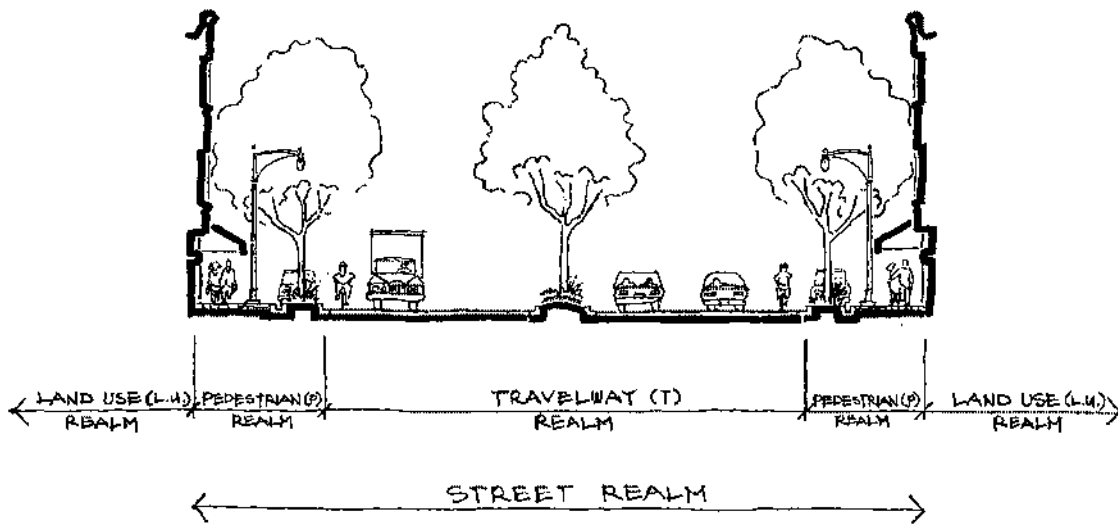
This conceptual approach was used to develop a regional street design classification map for the entire Metro region. The map was developed in partnership with local jurisdictions, and included a street design classification for any facility identified on the regional transit or motor vehicle functional classification maps.

Though the design of local street systems is generally beyond the scope of regional plans, the aggregate effect of local street design impacts the effectiveness of the regional system when local travel is restricted by a lack of connecting routes, and local trips are forced onto regional facilities. The following connectivity principles are also included in the RFP to guide future development of local street designs:

- anticipate opportunities to incrementally extend and connect local streets over time in primarily developed areas;
  - allow local street systems to serve a mix of development types within a continuous street pattern;
  - encourage pedestrian travel by ensuring that the shortest, most direct routes are provided to nearby existing or planned commercial services, schools, parks and other neighborhood destinations;
  - ensure that local residents have access to existing or planned commercial services that provide for daily or weekly needs without using regional facilities;
  - allow narrow street designs to conserve land, calm traffic or promote connectivity;
- and
- limit closed street systems and cul-de-sac designs to situations where topography, environmental impacts or existing development patterns prevent full street connections.

## **THE DESIGNS: BUILDING CONSENSUS FOR SOLUTIONS THAT WORK**

The street design study included an extensive technical analysis of the full range of proposed street design classifications. However, because of the uniqueness of the street design classifications and implications for local project development, it was clear from the onset of the study that a “consensus” work team approach should be used to develop these classifications. The street design work team consisted of planning and engineering staff from many of the Portland region’s three counties and 24 cities. The work team was specifically designed to mix planners, engineers, and citizens in a spirited discussion about street design at monthly meetings. The work team also included representatives



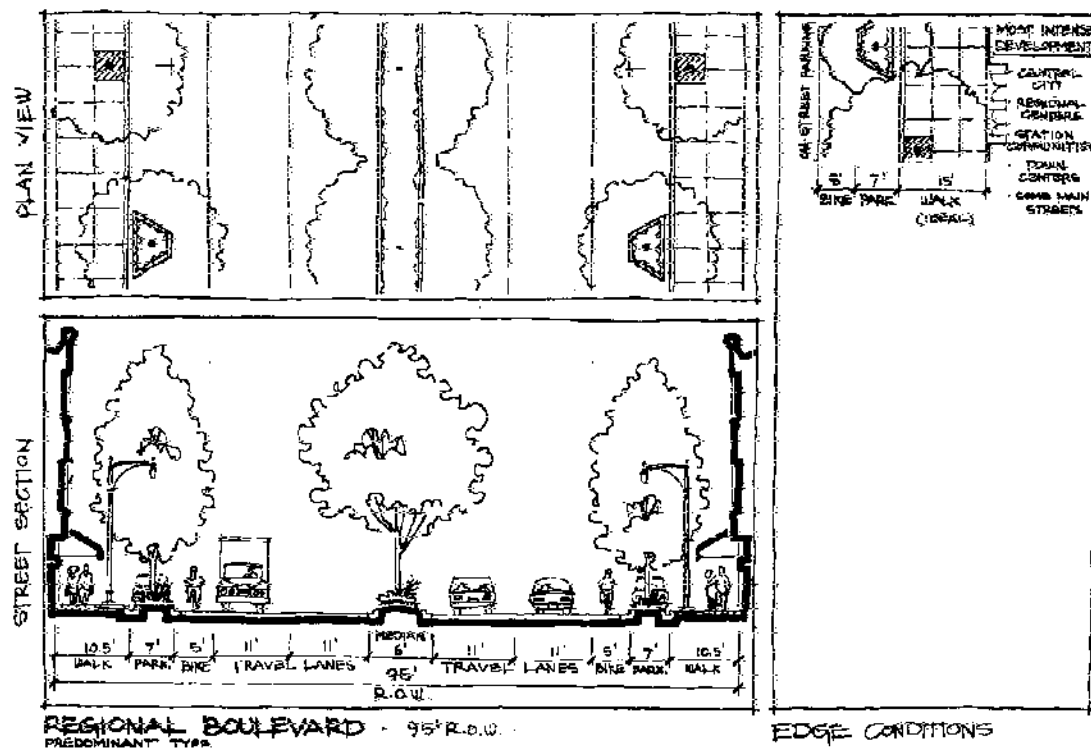
**FIGURE 2** The *Creating Livable Streets* handbook builds on the concept of a “street realm” that divides the street into discrete pedestrian and travelway realms whose design needs are distinct.

from Tri-Met (the region’s transit agency) and the Oregon DOT. Metro staff chaired the work team and coordinated the group’s discussions.

The street design work team met monthly throughout the course of the study, working closely with Metro staff and the project consultant to develop the regional street design guidelines and refine the classification system. Through a lively process of review, discussion and debate, the work team refined the following key design elements for each of the street design classifications:

- number and width of vehicle travel lanes
- motor vehicle design speeds
- median treatments
- parking requirements (on and off-street)
- bikeway design
- sidewalk design
- pedestrian buffer
- pedestrian amenities (e.g., benches and lighting)
- intersection spacing
- turning radius
- driveway spacing
- landscaping
- signalization

The project consultant recommended refinements to initial design elements based on a thorough literature review of national and international case studies where multi-modal street design guidelines were considered and/or implemented. The purpose of the literature review was to provide a broad overview of innovative approaches that address land use planning, street functional classification, multi-modal street design, roadway spacing, and access management.

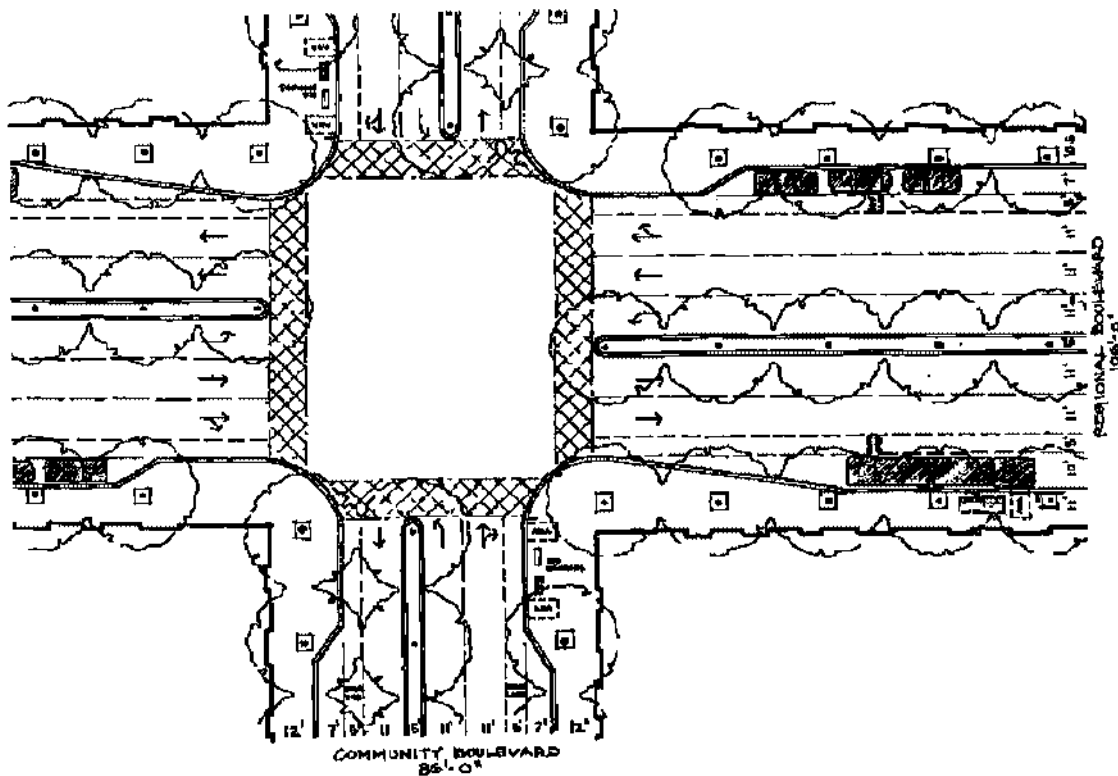


**FIGURE 3** The “boulevard” design concept seeks to create a transit and pedestrian-oriented design on major streets that will continue to carry heavy motor vehicle volumes. Because of the demand for such improvement in the Portland region, projects of the “boulevard” design type have been identified as a special category for regional funding.

A compendium of the literature review was compiled and included an analysis of the relative strengths, weaknesses and applicability of each approach. Relevant examples were cited from New York, Illinois, Connecticut, Virginia and California. In addition, the consultant used specific work completed by Calthorpe and Associates for the Sacramento region to develop preliminary concepts of the “street realm” to show how various modes could be accommodated within a given right-of-way and be integrated with adjacent land uses. To augment the research, Metro staff provided local case studies of design practices used in Portland and other cities throughout the Pacific Northwest.

Upon completing draft design guidelines, the project consultant also developed a matrix that compared Metro’s proposed design guidelines with the current design standards used in larger Portland area cities, counties and the Oregon DOT. An analysis of the matrix showed that several of the existing standards used in local codes, including sidewalk width, sidewalk buffers, bike lane width, turning radius, and number and width of travel lanes, fell outside of the proposed Metro guidelines. The differences found between existing local standards and the proposed regional guidelines served as the basis for meaningful discussion and debate by the work team. Ultimately, the work team was able to come to a consensus as to what the final guidelines should be. A comprehensive comparison is shown in Table 4 (page 83) of *Creating Livable Streets*.

Finally, the draft guidelines were in terms of cost. The project consultant completed two case studies—one redevelopment scenario and one “greenfield” scenario—to evaluate



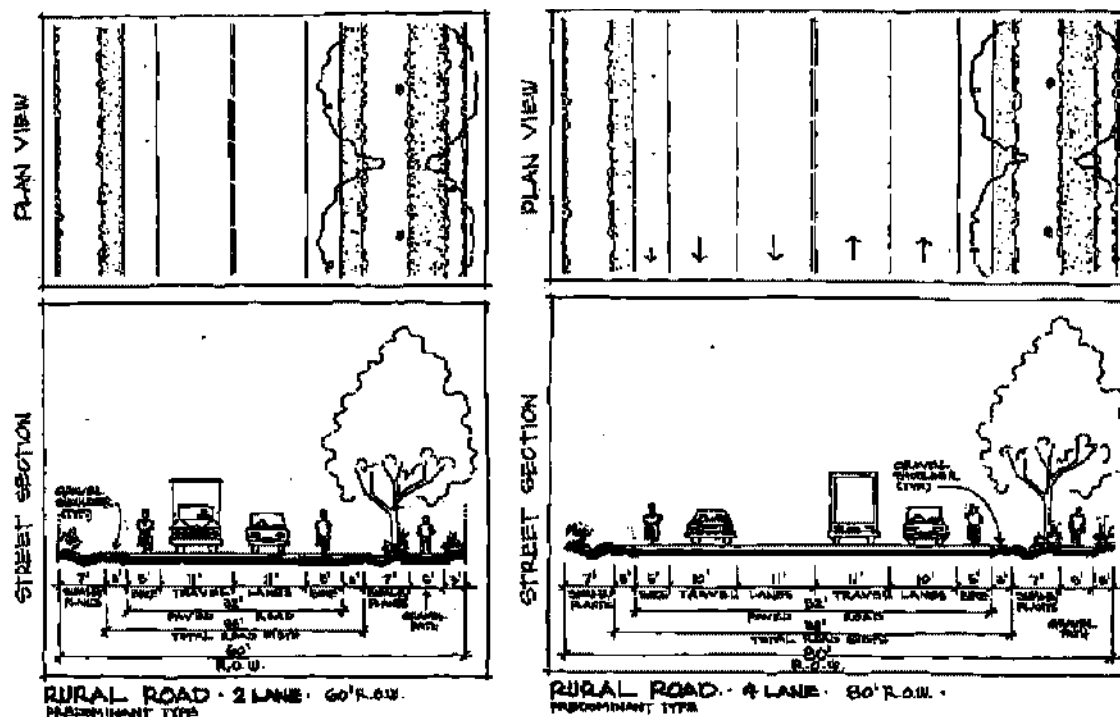
**FIGURE 4** Major street intersections in centers and transit corridors posed the greatest technical challenge for promoting alternative modes through street design. This figure shows one possible solution for a “boulevard” intersection at the juncture of two major streets, where heavy traffic flows must be addressed from the perspective of a pedestrian or transit user.

the cost of implementing the proposed guidelines in comparison to implementing existing standards in the Portland region. This analysis concluded that multi-modal designs are often an expensive, but necessary, retrofit to existing, substandard streets. However, the consultant’s financial analysis concluded that the regional standards were comparable in cost to less multi-modal designs when compared with “greenfield” improvements (e.g., new roads in developing areas). A summary of this cost analysis is included on pp. 84–85 of *Creating Livable Streets*.

## THE ANALYSIS: MODELING THE EFFECTS OF BETTER DESIGN

As noted earlier, a major goal of the street design study was to develop street design guidelines. The idea was to emphasize individual modes of travel consistent with the adjacent land use and functional classification of the street. In order to account for these policies in the transportation analysis, it was necessary to analyze design effects through motor vehicle capacity changes to the base transportation system. This approach involved a two-step process.

In the first part of the process, jurisdictions were asked to develop and submit a list of transportation projects designed to maximize system performance relative to the multi-modal and street design guidelines established by the work team. In some cases, less motor



**FIGURE 5** Metro has established rural reserves in areas outside the Urban Growth Boundary. The Rural Road designs are intended to provide for safe bicycle and pedestrian travel in these areas, while preserving the rural character of the surrounding area and discouraging urban development pressures.

vehicle capacity was assumed to reflect a shift in design emphasis from auto to alternative modes to accommodate the “boulevard” design concept. In all, over 1,000 projects were modeled to analyze the effects of various street designs and classifications on transportation system performance.

The second part of the process involved developing inputs into the Portland region’s travel forecasting model to allow transportation variables, such as parking costs, transit subsidies, ease of pedestrian travel and intersection density to be adjusted to closely reflect planned land uses at the analysis zone level. The net result was a model exercise that better predicts how mode share will respond to different land use types and transportation variables.

Parking costs were adjusted relative to existing downtown Portland costs to reflect more compact land development and costs expected in areas such as centers and transit corridors. Expected increases in transit use throughout the region were also reflected with reduced transit pass costs as a result of employer subsidies, and in the assumption of “fareless transit zones” in some centers and employment areas.

Intersection density represents the expected number of street connections per mile. One of the tasks of the street design study was to look at the traffic impacts of increasing the number of local street connections in selected communities. Five geographical areas were analyzed by the project consultant to study the effects of increased or reduced connectivity. Connectivity changes were based on existing roadways and potential future connections reflecting growth concept land use assumptions. The results of this task showed that by

increasing the number of street intersections per mile to a range of between 10 and 16 street connections per mile could:

- Delay reduced by 17% overall
- Traffic on arterials decreased by 13%
- Greater percentage of “regional” traffic (longer trips) on arterials
- Greatest benefit for auto traffic at 10–16 connections per mile

These were significant findings because they emphasized that even modest improvements in connectivity can benefit local and regional travel in addition to walking, bicycling, and transit access.

## **TOOLS FOR IMPLEMENTATION**

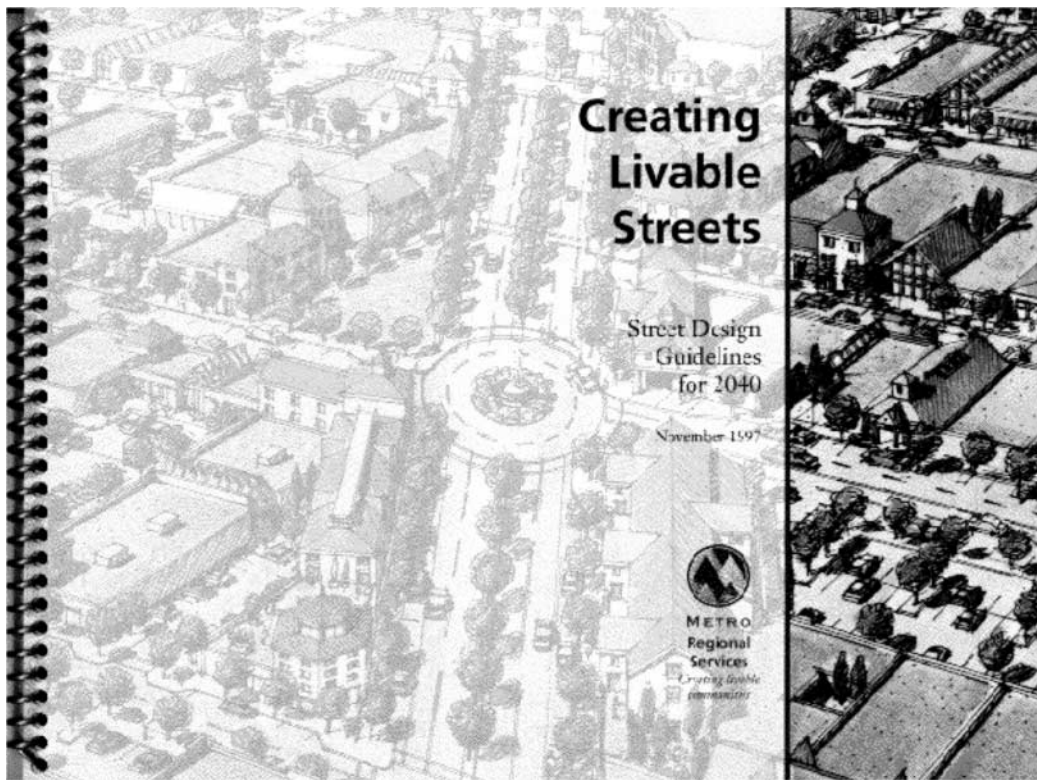
Local implementation of the Regional Framework Plan is defined through the Urban Growth Management Functional Plan (known as “the functional plan”). This plan defines local responsibilities for key planning areas including transportation and land use planning. The functional plan was adopted by consensus with local jurisdictions with an eye toward aggressive implementation of the RFP in the face of rapid urban growth. Title 6 of the functional plan includes specific requirements for transportation planning at the local level, including street design considerations, motor vehicle level-of-service standards, and street connectivity requirements.

Specifically, Title 6 requires that local jurisdictions review and modify their development codes as needed to promote multi-modal street designs that emphasize walking, biking and pedestrian travel in centers and corridors. In addition, Title 6 limits cul-de-sac designs to promote better connectivity in local street systems. Street connections in the range of 10–16 per mile are required for new residential and mixed-use development in order to encourage non-auto modes of travel and shorter, more direct auto travel. Title 6 also allows jurisdictions to adopt a lower motor vehicle level-of-service (LOS) standard for higher density land uses and major activity centers. The lower LOS standard recognizes that higher densities and multi-modal street designs better support walking, biking and use of transit. Higher levels of congestion can be tolerated while still meeting regional and local accessibility goals in these areas because more travel choices are provided. These Title 6 provisions combine to promote increased use of alternative modes, and are supported by technical work completed as part of the street design project.

The street design policies are also being implemented through the regional funding process. Regional funding and implementation of projects occurs over a four to five year cycle known as the Metropolitan Transportation Improvement Program (MTIP). During each funding cycle, local jurisdictions are asked to submit their most critical projects to achieve regional and local planning goals. Each project, in turn, undergoes analysis of the impacts on the regional transportation system with the goal to maintain livability, improve air quality, reduce vehicle miles traveled, as well as promote a multi-modal system design that provides for increased use of alternative modes.

In the current funding cycle, the region’s elected officials have specifically required all submitted projects to be consistent with the regional street design guidelines to be eligible for regional funds. Further, public officials created a special funding category for





**FIGURE 6** Since it was completed in 1997, more than 3,000 copies of the handbook have been distributed to government agencies, decision makers, consulting firms, and citizens in the region, as well as to interested persons throughout the U.S and abroad. The handbook is also available as a PDF file on Metro’s web site ([www.metro-region.org](http://www.metro-region.org)).

projects that result in “boulevard” design retrofits to existing streets. In the current cycle, nearly 20 “boulevard” retrofit projects totaling \$70 million were submitted for funding. By definition, these projects are located in centers and transit corridors, and are designed to promote alternative modes of travel and to revitalize traditional commercial districts.

The *Creating Livable Streets* handbook was prepared to give the Portland region appropriate regional street design guidelines to support local implementation of the Metro 2040 Growth Concept and Regional Transportation Plan. The guidelines were established to achieve two fundamental goals: to promote community livability by balancing all modes of transportation, and to consider the function and character of surrounding land uses when designing streets of regional significance. These two simple goals defined the principles that guided the development of the handbook. These goals also allow the handbook to be used as the “official” resource for local governments working to achieve compliance with Metro’s regional street design policies. The handbook is intended for citizens and elected officials as well as professional planners and engineers. To date, more than 3,000 copies of the handbook have been distributed to government agencies, decision makers, consulting firms, and citizens in the region, as well as interested persons throughout the U.S. and abroad.

Building consensus for the handbook among planners and engineers was important to its effectiveness as a tool for implementing regional policies. To achieve

this goal, the handbook provides a careful balance between design elements for increasing street livability (landscaping, building street frontages, streetscape features, and land use edge treatments) and to meet engineering and safety standards (lane width, medians, intersections, bicycle lanes, and sidewalks). Agreement was obtained on the most critical design elements amongst the work team. Consensus was also achieved with flexibility in constrained right-of-way conditions and in transitions from one street design type to another.

Gaining acceptance of the handbook from the region's engineering community required assurance that the design guidelines conform to American Association of State Highway and Transportation Officials (AASHTO) guidelines. This level of conformance was important to the engineering community even if the guidelines did not conform to the design standards of individual jurisdictions. Upon completion of the preliminary draft of *Creating Livable Streets*, Metro staff and the consultants held a series of technical workshops to present the guidelines to local engineers and planners. Input received at these workshops was used to develop the final document, which was completed in late 1997. Development of the handbook successfully demonstrated that streets can conform to AASHTO guidelines and encompass most of the design elements that increase the street's function, livability, appearance and safety for all modes of travel.

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